
CLAIMS

[Claim(s)]
[Claim 1] The 1st reaction band which oxygen content gas and a fuel are supplied [band], burns them and makes a hot combustion gas style form in a fission reactor, The manufacturing installation of the fullerene characterized by having the coal-for-coke-making-ized hydrogen feed hopper which supplies coal-for-coke-making-ized hydrogen in the middle of this combustion gas style, and having the 2nd reaction band which makes this coal-for-coke-making-ized hydrogen react and makes fullerene generate is used. The manufacture approach of the fullerene characterized by making the pressure of said 2nd reaction band under into atmospheric pressure.
[Claim 2] The manufacture approach of the fullerene characterized by said 2nd reaction band being in the downstream of said 1st reaction band in the manufacture approach of fullerene according to claim 1.
[Claim 3] The manufacture approach of the fullerene characterized by the temperature of said 2nd reaction band being 1000 degrees C or more in the manufacture approach of fullerene given in any 1 term of claims 1 and 2.
[Claim 4] The 1st reaction band which oxygen content gas and fuel gas are supplied [band] through the 1st burner, burns these, and makes a hot combustion gas style form in a fission reactor, Are in the downstream of this 1st reaction band, and it has the delivery of the 2nd burner which supplies coal-for-coke-making-ized hydrogen in the style of [said] combustion gas. The manufacturing installation of the fullerene characterized by having the 2nd reaction band which makes said coal-for-coke-making-ized hydrogen gasified and supplied react in said combustion gas style, and makes fullerene generate.
[Claim 5] It is the manufacturing installation of the fullerene which the delivery of said 2nd burner has a clearance in the upstream of said 2nd reaction band in the manufacturing installation of fullerene according to claim 4, and are characterized by carrying out a large number formation and carrying out distributed emission of said coal-for-coke-making-ized hydrogen into said combustion gas style.
[Claim 6] It is the manufacturing installation of the fullerene characterized by consisting of a minor diameter discharge tube of a large number arranged by said 2nd burner penetrating said 1st reaction band in the manufacturing installation of fullerene according to claim 5.
[Claim 7] It is the manufacturing installation of the fullerene characterized by carrying out mixture arrangement of two or more oxygen content gas nozzles and fuel gas nozzles to which said 1st burner emits independently said oxygen content gas and said fuel gas in the manufacturing installation of fullerene given in any 1 term of claims 4-6, respectively.
[Claim 8] It is the manufacturing installation of the fullerene characterized by for the head of said 1st burner consisting of a porosity member in the manufacturing installation of fullerene given in any 1 term of claims 4-6, and blowing off where said oxygen content gas and said fuel gas are mixed from a front face.
[Claim 9] It is the manufacturing installation of the fullerene characterized by performing mixing of said oxygen content gas and said fuel gas within said 1st burner, and supplying independently said oxygen content gas and said fuel gas to said 1st burner for another piping in the

manufacturing installation of fullerene according to claim 8.
[Claim 10] It is the manufacturing installation of the fullerene characterized by supplying the accumulator which premixing of said oxygen content gas and said fuel gas was carried out in the manufacturing installation of fullerene according to claim 8, and was prepared in the lower part of said head.
[Claim 11] Said 1st burner is the manufacturing installation of the fullerene which have header tubing with which the jet nozzle of many minor diameters set the clearance in the manufacturing installation of fullerene given in any 1 term of claims 4-6, and was formed, and are characterized by supplying said oxygen content gas with which premixing was carried out to this header tubing, and said fuel gas.
[Claim 12] In the manufacturing installation of fullerene given in any 1 term of claims 4-6 said 1st burner The 1st header tubing with which the jet nozzle of the minor diameter of a large number which spout said oxygen content gas set the clearance, and was formed, It has the 2nd header tubing with which the jet nozzle of the minor diameter of a large number which have a clearance with said 1st header tubing, are arranged, and spout said fuel gas set the clearance, and was formed. The manufacturing installation of the fullerene characterized by supplying independently said oxygen content gas and said fuel gas to said 1st header tubing and said 2nd header tubing for another piping, respectively.
[Claim 13] The manufacturing installation of the fullerene characterized by mixing oxygen content gas in the coal-for-coke-making-ized hydrogen supplied from said 2nd burner in the manufacturing installation of fullerene given in any 1 term of claims 4-12.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the manufacture approach of fullerene, and its equipment.
[0002]
[Description of the Prior Art] Fullerene (it may only be hereafter called fullerene) is the generic names of the third carbon allotrope which ranks second to a diamond and a graphite, and it is the carbon molecule of the shape of hollow husks closed in the network of five membered-rings and six membered-rings so that it might be represented by C60 and C70 grade. Although it is comparatively that existence of fullerene was finally checked and it is a comparatively new carbon material, it is admitted that the special molecular structure, therefore specific physical property are shown, for example, innovative application development is being quickly developed over the wide range following fields.
(1) Application to a superhard ingredient : since purification of the artificial diamond which has a fine crystal grain child by using fullerene as a precursor is possible, use to an abrasion resistance material with added value is expected.
(2) Application to drugs : research as an application of an anticancer agent, an acquired immunode-ficiency syndrome, osteoporosis and the Alzheimer remedy, a contrast medium, a stent ingredient, etc. is advanced by using C60 derivative and an optical device.
(3) Application to a superconducting material : if metallic potassium is doped to a fullerene thin film, it is discovered that a superconducting material with a high transition temperature called 18K can be made, and since various, attract attention.
(4) Application to semi-conductor manufacture : it uses that resist structure is further strengthened with mixing C60 with a resist, and the application to next-generation semi-conductor manufacture is expected.
[0003] Also in the fullerene of various carbon numbers, C60 and C70 are comparatively easy to compound, and it is expected that future need so also increases explosively. The approach shown below is mentioned as the manufacture approach of fullerene learned now.
(1) It is the approach of irradiating the pulse laser of a high energy consistency at the carbon target placed into laser vacuum deposition rare gas, and compounding by evaporation of a carbon atom. The quartz tube with which rare gas flows is placed into an electric furnace, and a graphite sample is placed into the quartz tube. If laser is irradiated and is evaporated in a graphite sample from the upstream of the flow of gas, the soot containing fullerene, such as C60 and C70, will adhere to the wall of the quartz tube with which near the electric furnace outlet got cold. The evaporation per shot of laser is slight and it is unsuitable for extensive manufacture.
(2) It is the approach to which carry out energization heating and a graphite rod is made to sublimate in the container under the reduced pressure filled with resistance heating method gaseous helium. Since the electric resistance loss in a circuit is large, it is unsuitable for extensive manufacture.
[0004] (3) It is the approach to which the carbon of a lifting and an anode plate is made to

sublimate arc discharge in the condition of having contacted two graphite electrodes lightly in the gaseous helium in number of arc discharge methods 10kPa, or having detached about 1-2mm. It is used for extensive manufacture of the fullerene in a current works scale.
(4) Instead of using radio frequency heating method resistance heating and arc discharge, it is the approach of heating an eddy current to raw material graphite by RF induction, and evaporating a sink and raw material graphite.
(5) It is the approach of carrying out the incomplete combustion of the hydrocarbon raw materials, such as benzene, in the mixed gas of inert gas, such as combustion method helium, and oxygen. It is observed as the mass-producing method for being a point usable to liquid fuel etc., and the point that a manufacturing installation is simple, and opposing an arc discharge method in the soot (fullerene etc.) which sub** in that several% of a benzene fuel serves as soot, and the about 10% becomes fullerene although manufacture effectiveness is not good.
(6) It is the approach of carrying out the pyrolysis of the naphthalene thermal decomposition method naphthalene at about 1000 degrees C.
[0005] Thus, although the synthesis method of various fullerene by current is proposed, the method of manufacturing fullerene in large quantities cheaply by any approach until now is not established. A combustion method is considered one of these approaches of the cheapest and efficient manufacture approach, for example, the manufacture approach of the fullerene by burning a carbon inclusion in a flame in the patent reference 1, and collecting condensates in it is indicated. This approach is an approach of manufacturing fullerene by burning a carbon inclusion in a flame, and the fuel for combustion and the raw material of fullerene are the same carbon inclusions substantially. Although fullerene is contained in the soot-like matter and it is generated, a part of this soot-like matter is the so-called carbon black.
[0006] As the manufacture approach of carbon black, the furnace method, a channel process, thermal **, the acetylene method, etc. are learned, and the furnace method is industrially mentioned as the general manufacture approach. The carbon black manufacturing installation (fission reactor) of the shape for example, of a cylinder is used for this approach. To ****, to horizontal or a perpendicular direction, supply oxygen content gas and fuels, such as air, and they are burned in the 1st reaction band of the fission reactor concerned. It is made to move to the 2nd reaction band with the cross section which was installed in the lower stream of a river of furnace shaft orientations, and reduced the obtained combustion gas style. It is the approach of supplying coal-for-coke-making-ized hydrogen (stock oil), making it reacting into the gas stream concerned, making carbon black generating, quenching gas by spraying of cooling water etc. to a gas stream further in the 3rd reaction band on the lower stream of a river, and stopping a reaction.
[0007]
[Patent reference 1] Patent Publication Heisei No. 507879 [six to] official report [0008]
[Problem(s) to be Solved by the Invention] However, by the manufacture approach of the above-mentioned usual carbon black, fullerene is hardly generated. In manufacture of fullerene, it has been a big technical problem how the rate of the fullerene contained in the soot-like matter obtained is raised. Generally, manufacture of fullerene is performed under reduced pressure and a diluent may be introduced all over a reaction field. It is known whenever [these reduced pressure] that diluent concentration will affect the yield of the above-mentioned fullerene.
[0009] In order to raise the yield of fullerene in the above and the patent reference 1, the approach of supplying energy further is stated to the flame from the external energy source as raising flame temperature and its means. As a desirable energy source, electric resistance heating which heats a flame directly, microwave heating, discharge heating, and counterflow heating that heats a flame by heat exchange with elevated-temperature gas are mentioned.
[0010] By the above and the patent reference 1, pure oxygen is used as an oxidizer for a combustion reaction, and the argon is used as a diluent. This is considered to be effective in gathering the yield of fullerene. However, the amount of the oxygen needed for combustion also becomes extensive, and pure oxygen becomes a special oxygen supply facility is required and

expensive [the manufacturing cost of fullerene] as a result, when a bomb or supply equipment of dedication etc. tends to be required and it is going to manufacture fullerene on a scale of industry especially.

[0011] So, it has not result in utilization for the reasons of the rate which the volume increases at the time of the actuation under that combustion temperature becomes low since there are many rates of that a flame is not stabilize compared with pure oxygen since the oxygen density is low although it can guess easily use air as an oxidizer of combustion in order to reduce a manufacturing cost in a combustion method, or nitrogen, especially reduced pressure, and passes a nozzle become quick. Since fullerene is various as the exotic material which bears the next generation, and new materials, it is observed, and development of the technique of manufacturing fullerene cheaply and easily in large quantities is desired.

[0012] This invention is made in view of a situation which was mentioned above, and it aims at offering the manufacture approach of the fullerene which manufacture fullerene cheaply and easily in large quantities, and its equipment.

[0013]

[Means for Solving the Problem] The first reaction band in which this invention persons supply oxygen content gas and a fuel, and burn them in a fission reactor as a result of examining various the optimal combustion methods and manufacturing installations which can manufacture fullerene in large quantities and cheaply, and a hot combustion gas style is made to form, The manufacturing installation of the fullerene which have the coal-for-coke-making-ized hydrogen feed hopper which supplies coal-for-coke-making-ized hydrogen in the style of combustion gas, and have the 2nd reaction band which makes coal-for-coke-making-ized hydrogen react and makes fullerene generate is used. Knowledge that fullerene is stably generable in large quantities by maintaining the pressure of the 2nd reaction band under at atmospheric pressure was acquired.

[0014] Namely, the manufacture approach of the fullerene concerning the 1st invention in alignment with said purpose The 1st reaction band which oxygen content gas and a fuel are supplied [band], burns them and makes a hot combustion gas style form in a fission reactor, The manufacturing installation of the fullerene characterized by having the coal-for-coke-making-ized hydrogen feed hopper which supplies coal-for-coke-making-ized hydrogen in the middle of this combustion gas style, and having the 2nd reaction band which makes this coal-for-coke-making-ized hydrogen react and makes fullerene generate is used, and the pressure of said 2nd reaction band is made under into atmospheric pressure. Since a fuel and oxygen content gas are supplied and are burned in the 1st reaction band, perfect combustion can be attained easily, for example and a hot combustion gas style can be formed. And by supplying coal-for-coke-making-ized hydrogen into the acquired hot gas stream, the pyrolysis of the coal-for-coke-making-ized hydrogen can be carried out easily, and the generation effectiveness of fullerene can be raised. Moreover, by making the pressure in the 2nd reaction band under into atmospheric pressure, and rarefying the mixed state of coal-for-coke-making-ized hydrogen and combustion gas, the pyrolysis of coal-for-coke-making-ized hydrogen can advance to homogeneity and the generation effectiveness of fullerene can be raised.

[0015] In the manufacture approach of the fullerene concerning the 1st invention, it is desirable that said 2nd reaction band is in the downstream of said 1st reaction band. By establishing the 2nd reaction band in the downstream of the 1st reaction band, the hot combustion gas formed in the 1st reaction band can be immediately introduced into the 2nd reaction band. Consequently, temperature of the 2nd reaction band can be made into an elevated temperature. In the manufacture approach of the fullerene concerning the 1st invention, it is desirable that the temperature of said 2nd reaction band is 1000 degrees C or more. By making temperature of the 2nd reaction band into 1000 degrees C or more, the pyrolysis of the supplied coal-for-coke-making-ized hydrogen can be carried out in a short time certainly.

[0016] The manufacturing installation of the fullerene concerning the 2nd invention in alignment with said purpose The 1st reaction band which oxygen content gas and fuel gas are supplied [band] through the 1st burner, burns these, and makes a hot combustion gas style form in a

fission reactor, It is in the downstream of this 1st reaction band, and has the 2nd reaction band which makes said coal-for-coke-making-ized hydrogen which has the delivery of the 2nd burner which supplies coal-for-coke-making-ized hydrogen in the style of [said] combustion gas, and was gasified and supplied react in said combustion gas style, and makes fullerene generate. Since combustion of a fuel is performed in the 1st reaction band, control of a combustion condition becomes easy and hot combustion gas can be formed easily. Control of the pyrolysis of coal-for-coke-making-ized hydrogen becomes easy by introducing the obtained hot combustion gas style into the 2nd reaction band, and adjusting gas stream conditions, such as temperature of a hot combustion gas style, the rate of flow, and a flow rate, and the conditions of supply of coal-for-coke-making-ized hydrogen, since the pyrolysis of the coal-for-coke-making-ized hydrogen is supplied and carried out into this hot gas stream.

[0017] As for the delivery of said 2nd burner, in the manufacturing installation of the fullerene concerning the 2nd invention, it is desirable to have a clearance in the upstream of said 2nd reaction band, and for a large number formation to be carried out and to carry out distributed emission of said coal-for-coke-making-ized hydrogen into said combustion gas style. By forming in the upstream of the 2nd reaction band the delivery of the 2nd burner which supplies coal-for-coke-making-ized hydrogen, direct coal-for-coke-making-ized hydrogen can be supplied into the hot combustion gas style which flows from the 1st reaction band, and the pyrolysis of the coal-for-coke-making-ized hydrogen can be carried out easily. Moreover, since distributed emission of the coal-for-coke-making-ized hydrogen is carried out into combustion gas from many deliveries, coal-for-coke-making-ized hydrogen can be pyrolyzed to homogeneity in combustion gas in a short time. As for said 2nd burner, in the manufacturing installation of the fullerene concerning the 2nd invention, it is desirable to consist of a minor diameter discharge tube of a large number arranged by penetrating said 1st reaction band. Since coal-for-coke-making-ized hydrogen is supplied with many minor diameter discharge tubes, distributed emission of the coal-for-coke-making-ized hydrogen can be uniformly carried out into the combustion gas style of the elevated temperature of the 2nd reaction band. Moreover, since a minor diameter discharge tube penetrates the 1st reaction band and is arranged, coal-for-coke-making-ized hydrogen is gradually heated by hot combustion gas, passing through the inside of a minor diameter discharge tube, and can promote the pyrolysis in the inside of the combustion gas style of the elevated temperature of the 2nd reaction band.

[0018] In the manufacturing installation of the fullerene concerning the 2nd invention, mixture arrangement of two or more oxygen content gas nozzles and fuel gas nozzles to which said 1st burner emits independently said oxygen content gas and said fuel gas, respectively may be carried out. Diffusive mixing of the oxygen content gas and fuel gas which were supplied can be carried out, they can be in the uniform mixed state, and can be made to exist in the 1st reaction band by considering as such a configuration. Moreover, in the manufacturing installation of the fullerene concerning the 2nd invention, the head of said 1st burner consists of a porosity member, and can be considered as the configuration which blows off from a front face where said oxygen content gas and said fuel gas are mixed. By considering as such a configuration, oxygen content gas and fuel gas can be supplied to the 1st reaction band, where premixing is carried out.

[0019] In the manufacturing installation of the fullerene concerning the 2nd invention, mixing of said oxygen content gas and said fuel gas is performed within said 1st burner, and it can consider as the configuration to which said oxygen content gas and said fuel gas are independently supplied for another piping at said 1st burner. Since mixing of oxygen content gas and fuel gas is performed within the 1st burner, it is not necessary to establish separately the premixing means of oxygen content gas and fuel gas, and the configuration of the manufacturing installation of fullerene becomes easy. In the manufacturing installation of the fullerene concerning the 2nd invention, said oxygen content gas and said fuel gas can be considered as the configuration supplied to the accumulator which premixing was carried out and was prepared in the lower part of said head. Since premixing of oxygen content gas and the fuel gas is carried out and they are supplied to the accumulator of the lower part of a head, structure of

the 1st burner can be simplified.
[0020] In the manufacturing installation of the fullerene concerning the 2nd invention, said 1st burner has header tubing with which the jet nozzle of many minor diameters set the clearance, and was formed, and can consider it as the configuration to which said oxygen content gas with which premixing was carried out to this header tubing, and said fuel gas are supplied. By considering as such a configuration, where premixing is carried out, distributed emission of oxygen content gas and the fuel gas can be carried out in the 1st reaction band. In the manufacturing installation of the fullerene concerning the 2nd invention said 1st burner The 1st header tubing with which the jet nozzle of the minor diameter of a large number which spout said oxygen content gas set the clearance, and was formed, It has the 2nd header tubing with which the jet nozzle of the minor diameter of a large number which have a clearance with said 1st header tubing, are arranged, and spout said fuel gas set the clearance, and was formed. It can consider as the configuration to which said oxygen content gas and said fuel gas are independently supplied for another piping, respectively at said 1st header tubing and said 2nd header tubing. Diffusive mixing of the oxygen content gas and fuel gas by which distributed emission was carried out can be carried out, they can be in the uniform mixed state, and can be made to exist in the 1st reaction band by considering as such a configuration.
[0021] In the manufacturing installation of the fullerene concerning the 2nd invention, oxygen content gas is mixable in the coal-for-coke-making-ized hydrogen supplied from said 2nd burner. In the pyrolysis of coal-for-coke-making-ized hydrogen, the temperature of combustion gas falls by the pyrolysis of coal-for-coke-making-ized hydrogen for endothermic reaction. For this reason, it can prevent that fill up the heat energy consumed when a part of coal-for-coke-making-ized hydrogen was burned in the 2nd reaction band, heat energy was generated and coal-for-coke-making-ized hydrogen pyrolyzed by mixing oxygen content gas in coal-for-coke-making-ized hydrogen, and the temperature of combustion gas falls.
[0022]
[Embodiment of the Invention] Then, referring to the attached drawing, it explains per gestalt of the operation which materialized this invention, and an understanding of this invention is presented. The explanatory view of the fullerene manufacturing installation which applied the manufacture approach of the fullerene which drawing 1 (A) and (B) require for the gestalt of operation of the 1st of this invention, respectively here, The explanatory view of the manufacturing installation of the fullerene which a plane section Fig., drawing 2 (A), and (B) require for the gestalt of operation of the 2nd of this invention, respectively, The explanatory view of the manufacturing installation of the fullerene which a plane section Fig., drawing 3 (A), and (B) require for the gestalt of operation of the 3rd of this invention, respectively, A plane section Fig., the partial explanatory view of the manufacturing installation of the fullerene which drawing 4 requires for the gestalt of operation of the 4th of this invention, The explanatory view of the manufacturing installation of the fullerene which drawing 5 (A) and (B) require for the gestalt of operation of the 5th of this invention, respectively, a plane section Fig., drawing 6 (A), and (B) are the explanatory view of the manufacturing installation of the fullerene concerning the gestalt of operation of the 6th of this invention, and a plane section Fig., respectively.
[0023] The manufacture approach of the fullerene concerning the gestalt of operation of the 1st of this invention is explained using drawing 1 . The manufacture approach of the fullerene concerning the gestalt of the 1st operation is related with the approach of introducing coal-for-coke-making-ized hydrogen into the manufacturing installation 3 of the fullerene constituted by forming the 1st reaction band 1 and the 2nd reaction band 2 in fission reactor 3a, and manufacturing fullerene by burning.
[0024] The manufacturing installation 3 of fullerene has the 2nd reaction band 2 which coal-for-coke-making-ized hydrogen is supplied [band], makes it react the 1st reaction band 1 in which a combustion gas style is made to form, and in the style of [which were formed there] combustion gas, and makes fullerene generate. The 2nd reaction band 2 may be in the downstream of the combustion gas flow direction (it may be hereafter called "shaft orientations") which may be the almost same field (an outside or inside) as the 1st reaction

band 1, and was formed in the 1st reaction band 1.
[0025] Drawing 1 shows the case where the 2nd reaction band 2 is located on the lower stream of a river of the 1st reaction band 1.
Generally in the [1st reaction band] 1st reaction band 1, a combustion gas style hot by supplying a fuel and oxygen content gas and burning them, respectively is generated toward the lower stream of a river of the 2nd reaction band 2, i.e., fission reactor 3a, from a fuel feed hopper and oxygen content gas supply opening.
[0026] Even if supply of a fuel and oxygen content gas is the so-called premixing method mixed before entering in fission reactor 3a, it may be the so-called diffusive-mixing method supplied to fission reactor 3a from the nozzle which became independent, respectively. In drawing 1 , in the case of a diffusive-mixing method, a fuel is supplied from the central fuel feed hopper 7, and it supplies oxygen content gas from the oxygen content gas supply openings 5 and 6 of the perimeter. Moreover, a premixing method and a diffusive-mixing method may be combined, for example, in drawing 1 , from the oxygen content gas supply opening 5, what mixed oxygen content gas with the fuel beforehand may be supplied, and the fuel from the fuel feed hopper 7 may be independently supplied for oxygen content gas from the oxygen content gas supply opening 6, respectively.
[0027] It may be the purpose that this 1st reaction band 1 generates hot combustion gas, and that combustion method may be what kind of well-known combustion methods, such as premixed combustion, diffusive burning, laminar-flow combustion, turbulent flow combustion, and elevated-temperature air combustion. Moreover, although combustion in the 1st reaction band 1 may be perfect combustion or you may be incomplete combustion as long as the temperature which becomes generable [fullerene] in the 2nd reaction band 2 is acquired, it is desirable that it is perfect combustion with the large calorific value to fuel used. When the 1st reaction band 1 is incomplete combustion with the so-called superfluous fuel, the soot-like matter which contains fullerene even in the 1st reaction band 1 may generate.
[0028] However, the combustion by the lean mixture whose oxygen required for combustion is more than the amount of stoichiometry oxygen of the combustion in this 1st reaction band 1 is preferably better. As oxygen content gas, the gas which mixed non-flammable gas, such as argon gas and nitrogen gas, at a rate of arbitration can be used for air, oxygen gas, or these. NOX especially in elevated-temperature combustion Pure oxygen may be used in order to suppress generating. In order to gather the yield of fullerene, it is desirable to dilute using rare gas etc. in a combustion process. Rare gas may be supplied from the exclusive nozzle for supply, and may be beforehand mixed in a fuel, coal-for-coke-making-ized hydrogen, and oxygen content gas.
[0029] As a fuel, coal system liquid fuel, such as petroleum system liquid fuel, such as fuel gas, such as hydrogen, a carbon monoxide, natural gas, and petroleum gas, a fuel oil, benzene, and toluene, and creosote oil, can be used. Especially, as a fuel used with the gestalt of this operation, fuel gas is desirable. Moreover, although what is necessary is for fullerene to obtain just to adjust suitably the mean temperature in the 1st reaction band 1 at the time of fullerene manufacture, it is preferably made into 1600 degrees C or more still more preferably 1300 degrees C or more. This is because the productivity of fullerene goes up, so that the temperature of combustion gas is an elevated temperature. Even if an upper limit is too high not much, the productivity of fullerene may fall. Moreover, what is necessary is just to determine after taking into consideration the heat-resistant problem by the quality of the material of a fission reactor.
[0030] If opening of the arrangement of the fuel feed hopper 7 and the oxygen content gas supply openings 5 and 6 is carried out to fission reactor 3a, it is arbitrary. In drawing 1 , opening of the fuel feed hopper 7 and the oxygen content gas supply openings 5 and 6 is carried out to the same fission reactor 3a side. The configuration of each feed hoppers 5, 6, and 7 which are carrying out opening into fission reactor 3a may be arbitrary, and may be the indeterminate form of the shape of a polygon, such as an approximate circle form, an ellipse form, and the shape of a trigonum and a rectangular head, a gourd mold, etc.

[0031] As for fission reactor 3a internal pressure, it is desirable that it is under atmospheric pressure, and the more desirable range is 10 - 300torr.
Coal-for-coke-making-ized hydrogen is supplied from the coal-for-coke-making-ized hydrogen feed hopper 4 in the style of [which was formed in the 1st reaction band 1] combustion gas, and fullerene is made to generate in the [2nd reaction band] 2nd reaction band 2 by carrying out partial combustion of a part of this coal-for-coke-making-ized hydrogen. In order to carry out partial combustion, it is good also considering the combustion in the 1st reaction band 1 as hyperoxia so that oxygen may remain. Moreover, a nozzle may be arranged to the 2nd reaction field 2, and oxygen content gas may be supplied to it from an oxygen content gas supply nozzle.

[0032] Under the present circumstances, as for the above-mentioned coal-for-coke-making-ized hydrogen supplied into combustion gas, or oxygen content gas, it is desirable to be supplied in fission reactor 3a as much as possible at homogeneity. For this reason, it is desirable to be equally arranged so well that many by the number of the coal-for-coke-making-ized hydrogen feed hopper 4 installed in the 2nd reaction band 2 and an oxygen content gas supply nozzle in fission reactor 3a.
[0033] What is necessary is just to choose the die length of the 2nd reaction band suitably according to the magnitude of fission reactor 3a, the class of fullerene to manufacture, etc. The location and configuration of the 2nd reaction band may be arbitrary, and may be the inside of the 1st reaction band, or may be an outside, and as shown in drawing 1 , they may be in the downstream of the 1st reaction band 1. It is more desirable for the cross-section configuration of the 2nd reaction band not to change, although the configuration of the 2nd reaction band is also arbitrary. The reason is that it will have effect which is not desirable on the fullerene to generate if influenced by the flow by the cross-section configuration of the 2nd reaction band changing in the process which fullerene generates of turbulence.
[0034] Although what is necessary is just to choose the mean temperature of the 2nd reaction band 2 suitably by the fullerene to manufacture, in order that coal-for-coke-making-ized hydrogen may evaporate and react to homogeneity, it is desirable that it is an elevated-temperature ambient atmosphere enough. It is desirable that it is specifically 1000 degrees C or more, and it is especially desirable that it is 1700-1900 degrees C 1000-1900 degrees C especially. Moreover, in the 2nd reaction band 2, it is desirable to control the oxygen density in combustion gas as much as possible. It is because there is a thing of coal-for-coke-making-ized hydrogen, the generation reaction band 2, i.e., 2nd reaction band, of fullerene, which combustion takes place actively in part, therefore the ununiformity of the temperature in the 2nd reaction band 2 produces when oxygen exists so much in combustion gas. the oxygen density in combustion gas -- desirable -- less than [3vol%] -- it is 0.05 - 1vol% still more preferably.
[0035] In the gestalt of this operation, the location which supplies coal-for-coke-making-ized hydrogen is arbitrary and can prepare a coal-for-coke-making-ized hydrogen feed hopper according to the configuration of a fission reactor. For example, a coal-for-coke-making-ized hydrogen feed hopper may be prepared in the contraction section which may prepare a coal-for-coke-making-ized hydrogen feed hopper in the part from which the path of fission reactor 3a serves as max, and the path is reducing. Furthermore, as it ** to drawing 1 , the coal-for-coke-making-ized hydrogen feed hopper 4 may be formed in the contraction section which the part from which the path of fission reactor 3a serves as max, and the path are reducing, respectively. The rate of flow of the gas in the location where coal-for-coke-making-ized hydrogen is introduced, the strength of a turbulent flow, etc. are controllable by the location of the coal-for-coke-making-ized hydrogen feed hopper 4.
[0036] As coal-for-coke-making-ized hydrogen, the thing of well-known arbitration can be used conventionally. For example, aromatic series system hydrocarbons, such as benzene, toluene, a xylene, naphthalene, and an anthracene, Coal system hydrocarbons, such as creosote oil and a carboxylic-acid oil, ethylene heavy-ends oil, Aliphatic saturated hydrocarbon, such as petroleum system heavy oil, such as FCC oil (fluidized-catalytic-cracking residue oil), acetylene series

unsaturated hydrocarbon, the hydrocarbon of ethylene series, a pentane, and a hexane, etc. is mentioned, and these may be mixed and used at a rate of independent or arbitration. It is desirable to use the aromatic series system hydrocarbon refined especially, and aromatic series system hydrocarbons, such as benzene and toluene, are especially desirable. Its higher one is desirable, and it is so good that its purity is close to 100% in case the purity of a raw material uses an aromatic series system hydrocarbon especially.

[0037] Two or more locations of the coal-for-coke-making-ized hydrogen feed hopper in a fission reactor may be prepared on the cross-section periphery of the flow direction of combustion gas, and the location which has two or more coal-for-coke-making-ized hydrogen feed hoppers on still such same periphery may be established in the flow direction of combustion gas multistage. In order to make generation reaction time of fullerene into homogeneity and for physical properties to obtain uniform fullerene, it is desirable to install as many coal-for-coke-making-ized hydrogen feed hoppers as possible on the same periphery.

[0038] Moreover, although the form of the nozzle used for the coal-for-coke-making-ized hydrogen feed hopper 4 can be chosen suitably, when using the coal-for-coke-making-ized hydrogen of a liquid, in order to spray on homogeneity minutely more, it is desirable that the diameter of an initial drop of the coal-for-coke-making-ized hydrogen immediately after spraying from nozzles, such as 2 hydraulic nozzles which inject the supplied liquid with another liquid, considers as a small thing as much as possible. Although what is necessary is just to choose suitably, before the coal-for-coke-making-ized hydrogen sprayed on the 2nd reaction band 2 evaporates, as for the coal-for-coke-making-ized hydrogen supply approaches, such as a diameter of opening of the coal-for-coke-making-ized hydrogen feed hopper 4, a form, protrusion condition into a furnace, a supply include angle to a combustion gas style, and a gas-liquid ratio, the rate of flow, a flow rate, temperature, etc., it is desirable to spray on conditions which do not adhere to the furnace wall of the 2nd reaction band 2. By spraying such, the foreign matter in the soot-like matter obtained can be reduced.

[0039] The thing of arbitration can be used if it is the quality of the material which has thermal resistance, such as a metal and refractories, as internal insulation which constitutes the 1st reaction band 1 and the 2nd reaction band 2. Since the temperature of internal combustion gas becomes beyond metaled heat-resistant temperature when using a metal, it is necessary to cool from the outside by taking structures, such as rolling water cooled jacket structure and a water-cooled tube. As ingredients other than a metal, there are SiC, a diamond, nitriding aluminum, silicon nitride, ceramic system refractory material, etc., for example.

[0040] It is made into the structure which cools preferably 1000 degrees C or less of combustion gas styles containing the soot-like matter (the thing in the middle of a reaction is included) containing fullerene at 800 degrees C or less from the 2nd reaction band 2 after the downstream. Water etc. may be sprayed from a reaction halt fluid feed hopper, and, specifically, you may cool by passing the passage which cooled the exterior according to water-cooled structure etc. Especially, especially when the path of passage is small, even if it does not consider as water-cooled structure, it may fully be cooled by the natural heat dissipation to atmospheric air.

[0041] It dissociates with gas (not shown) and the fullerene and the soot-like matter which were cooled are recovered by the uptake bag filter prepared in the point of passage. The extraction approach of fullerene can use well-known general processes, such as making it adhere to such a bag filter or a passage wall etc.

[0042] As shown in drawing 2 , the manufacturing installation 10 of the fullerene concerning the gestalt of operation of the 2nd of this invention The 1st reaction band 13 which the oxygen content gas and fuel gas which were supplied through the 1st burner 12 in the fission reactor 11 burn, and forms a hot combustion gas style, It is in the downstream of the 1st reaction band 13, and has the 2nd reaction band 16 which makes the coal-for-coke-making-ized hydrogen which has the delivery 15 of the 2nd burner 14 which supplies coal-for-coke-making-ized hydrogen in the style of combustion gas, and was gasified and supplied react in a combustion gas style, and makes fullerene generate. Hereafter, these are explained to a detail. The fission reactor 11 is

equipped with the cylindrical shape-like side-attachment-wall section 17 and the edge wall 19 which it connects with the end side of the side-attachment-wall section 17, and an outer diameter contracts gradually, and forms the exhaust port 18. The side-attachment-wall section 17 and the edge wall 19 consist of heat-resisting steel, such as stainless steel. Furthermore, the refractories which are not illustrated are lined by the inner skin by the side of the other end of the side-attachment-wall section 17. As refractories, the refractory brick of the quality of an alumina and the unshaped refractories of the quality of an alumina can be used, for example. Moreover, the end side of the exhaust pipe which is not illustrated is connected to an exhaust port 18, and the other end side of an exhaust pipe is connected to the exhaust air pump. For this reason, while changing the inside of a fission reactor 11 into the reduced pressure condition of under atmospheric pressure, the combustion gas containing the soot-like matter generated in the fission reactor 11 can be discharged outside from the inside of a fission reactor 11.

[0043] The 1st burner 12 attached in base 17a by the side of the other end of the side-attachment-wall section 17 has two or more oxygen content gas nozzles 21 linked to the oxygen content gas supply piping 20, and the fuel gas nozzle 23 linked to the fuel gas charging line 22, and mixture arrangement of each of these gas nozzles 21 and 23 is carried out at base 17a. Moreover, the oxygen content gas nozzle 21 and the fuel gas nozzle 23 are formed with heat-resisting steel, such as stainless steel. For this reason, after the oxygen content gas supplied from the oxygen content gas nozzle 21 and the fuel gas supplied from the fuel gas nozzle 23 are emitted, diffusive mixing of it will be carried out, it will be in the uniform mixed state, and burns in the 1st reaction band 13. And the formed hot combustion gas style flows into the 2nd reaction band 16 of the downstream. The 2nd burner 14 attached in the other end side of the side-attachment-wall section 17 consists of a minor diameter discharge tube 24 (for example, formed with heat-resisting steel, such as stainless steel) of a large number arranged by penetrating the 1st reaction band 13. Consequently, the delivery 15 established in the tip side of the minor diameter discharge tube 24 has a clearance in the upstream of the 2nd reaction band 16, and is arranged at it. Moreover, the end face side of each minor diameter discharge tube 24 is connected to the coal-for-coke-making-ized hydrogen charging line 25. For this reason, direct coal-for-coke-making-ized hydrogen can be supplied at homogeneity into the hot combustion gas style which flows from the 1st reaction band 13, and coal-for-coke-making-ized hydrogen can be pyrolyzed to homogeneity in a short time.

[0044] Next, the manufacture approach of the fullerene which used the manufacturing installation 10 of the fullerene concerning the gestalt of operation of the 2nd of this invention is explained to a detail. The fuel gas nozzle 23 to fuel gas is supplied for oxygen content gas from the oxygen content gas nozzle 21, a combustion gas style hot by burning these is formed, and it is made to circulate toward the lower stream of a river of a fission reactor 11. As oxygen content gas, the gas (for example, the concentration of inert gas can be adjusted in not more than 90 mol % exceeding 0 or 0) which mixed inert gas, such as argon gas, at a rate of arbitration can be used for the oxygen gas which is a source of oxygen. As a source of oxygen, from a viewpoint of the yield of fullerene, oxygen gas is desirable and air is desirable from a viewpoint of the ease of carrying out of acquisition of the source of oxygen etc. In order to raise especially combustion temperature, before these oxygen content gas is supplied in a fission reactor 11, it is desirable to become hot beforehand. As the approach of a preheating, what kind of well-known approaches, such as heat exchange with the combustion gas which used the heat exchanger, and the so-called regeneration burner, may be used. With [the temperature of this preheating] ordinary temperature [beyond], what kind of temperature is sufficient, but in order to gather the yield of fullerene, the high temperature is more desirable as much as possible. It is desirable more preferably that it is beyond the self-ignition temperature of combustion gas.

[0045] What gasified coal system liquid fuel which gasified petroleum system liquid fuel, such as fuel gas, such as a carbon monoxide, natural gas, and petroleum gas, and a fuel oil, such as a thing and creosote oil, as fuel gas can be used. Fuel gas, such as natural gas and petroleum gas, is desirable especially. Moreover, in order to gather the yield of fullerene, it is desirable to also

dilute fuel gas using inert gas etc.

[0046] Then, the combustion gas style which fuel gas burns and forms under oxygen content gas is explained. While adjusting the amount of the fuel gas supplied from the fuel gas nozzle 23 on the conditions which fuel gas burns completely, and the amount of oxygen gas supplied from the oxygen content gas nozzle 21 and supplying the 1st reaction band 13, combustion of fuel gas starts with an ignition means to by_which hold the inside of a fission reactor 11 and an exhaust-air pump does not illustrate it in the condition of 10 - 300torr more preferably under atmospheric pressure through the exhaust pipe which was connected to the exhaust port 18 and which is not illustrated. Here, fuel gas and oxygen content gas become independent respectively, and since it is emitted in the 1st reaction band 13 from the oxygen content gas nozzle 21 which separated distance and was distributed, and the fuel gas nozzle 23, they can make homogeneity the combustion condition in the 1st reaction band 13. Moreover, since the pressure in a fission reactor 11 has become under atmospheric pressure in addition to diluting with inert gas, such as argon gas, and falling, the oxygen gas concentration in oxygen content gas can change the combustion condition in the 1st reaction band 13 into the condition that it was similar with the elevated-temperature air combustion condition. Consequently, combustion of fuel gas advances to homogeneity and can make temperature of the 1st reaction band 13 homogeneity and an elevated temperature (for example, 1000-1900 degrees C, preferably 1700-1900 degrees C).

[0047] Since the hot combustion gas formed in the 2nd reaction band 16 in the 1st reaction band 13 flows, the temperature of the upstream of the 2nd reaction band 16 becomes a 1000-1900-degree C elevated temperature. Distributed emission of the coal-for-coke-making-ized hydrogen is carried out into the combustion gas style of the upstream of the 2nd reaction band 16 from each delivery 15 of the minor diameter discharge tube 24 of a large number arranged by penetrating the 1st reaction band 13. Here, since the 1st reaction band 13 is penetrated and it is arranged, since the preheating is carried out while passing through the inside of the minor diameter discharge tube 24, the minor diameter discharge tube 24 pyrolyzes coal-for-coke-making-ized hydrogen, shortly after being emitted into a hot combustion gas style from a delivery 15. Consequently, the high pyrolysate of labile exists in combustion gas, and a fullerene precursor is formed when these coalesce. And it grows up, while a fullerene precursor moves with a combustion gas style, and it becomes fullerene. In addition, since the pyrolysis of coal-for-coke-making-ized hydrogen is endothermic reaction, heat energy is taken from combustion gas and the temperature of combustion gas falls. For this reason, oxygen content gas is mixed in coal-for-coke-making-ized hydrogen, a part of raw material carbon hydrogen is burned, and you may make it supply heat energy. however, a part of raw material carbon hydrogen -- since the ununiformity of the temperature in the 2nd reaction band 16 will arise and the generation effectiveness of fullerene will fall, if combustion takes place actively -- the oxygen density in combustion gas -- desirable -- less than [3vol%] -- it is 0.05 - 1vol% still more preferably.

[0048] As raw material carbon hydrogen, the thing of well-known arbitration can be used conventionally. For example, aromatic series system hydrocarbons, such as benzene, toluene, a xylene, naphthalene, and an anthracene, Coal system hydrocarbons, such as creosote oil and a carboxylic-acid oil, ethylene heavy-ends oil, Aliphatic saturated hydrocarbon, such as petroleum system heavy oil, such as FCC oil (fluidized-catalytic-cracking residue oil), acetylene series unsaturated hydrocarbon, the hydrocarbon of ethylene series, a pentane, and a hexane, etc. is mentioned, and these may be mixed and used at a rate of independent or arbitration. It is desirable to use the aromatic series system hydrocarbon refined especially, and aromatic series system hydrocarbons, such as benzene and toluene, are especially desirable. Its higher one is desirable, and it is so good that its purity is close to 100% in case the purity of the raw material carbon hydrogen which mainly serves as a raw material uses an aromatic series system hydrocarbon especially.

[0049] As shown in drawing 3 , it is the description that premixing of oxygen content gas and the fuel gas is carried out, and the manufacturing installation 26 of the fullerene concerning the gestalt of operation of the 3rd of this invention is supplied to the 1st burner 27. Therefore, only

the 1st burner 27 with which structures differ is explained, the same sign is given to the same component as the manufacturing facility 10 of the fullerene concerning the gestalt of the 2nd operation, and detailed explanation is omitted. It is produced with the heat-resistant metal and the 1st burner 27 has the head 28 which the whole surface side has exposed to the 1st reaction band 13 of a fission reactor 11, and the accumulator 29 prepared in the lower part of a head 28. And each minor diameter discharge tube 24 of the 2nd burner 14 opened the predetermined clearance mutually, penetrated the accumulator 29 and the head 28 from the lower part of an accumulator 29, and has projected them in the fission reactor 11.

[0050] Here, the head 28 consists of porosity members of sintering metal. If the porosity member has structure equipped with many free passage holes which are open for free passage to a side on the other hand from the whole surface side, it considers as the mixed gas which carried out premixing of oxygen content gas and the fuel gas to the accumulator 29 prepared in the lower part of a head 28 and it supplies from the mixed-gas charging line 30 Mixed gas can be moved to the field exposed to the 1st reaction band 13 side from the field by the side of an accumulator 29 through the free passage hole in a head 28, and can be spouted in the 1st reaction band 13. Therefore, combustion gas hot in the 1st reaction band 13 can be formed by burning the mixed gas which blew off in the 1st reaction band 13. And the coal-for-coke-making-ized hydrogen supplied through the coal-for-coke-making-ized hydrogen charging line 25 into the flowing hot combustion gas style from the 1st reaction band 13 can be supplied from the delivery 15 of each minor diameter discharge tube 24, and coal-for-coke-making-ized hydrogen can be pyrolyzed to homogeneity in a short time. In addition, since it is substantially the same, detailed explanation is abbreviated to the manufacture approach of the fullerene which used the manufacturing installation 10 of the fullerene which the manufacture approach of the fullerene which used the manufacturing facility 26 of the fullerene concerning the gestalt of operation of the 3rd of this invention requires for the gestalt of the 2nd operation.

[0051] In the manufacturing installation 31 of the fullerene concerning the gestalt of operation of the 4th of this invention, since oxygen content gas and fuel gas are independently supplied to the 1st burner 32 for another piping, it is the description that the manufacturing installation 26 of the fullerene concerning the gestalt of the 3rd operation differs from the structure of the 1st burner 32. Therefore, only the 1st burner 32 with which structures differ is explained, the same sign is given to the same component as the manufacturing facility 10 of the fullerene concerning the gestalt of the 2nd operation, and detailed explanation is omitted. That is, as shown in drawing 4 , the 1st burner 32 is produced with a heat-resistant metal, and has two or more gas blenders 35 which have an exhaust nozzle in the head 33 which consists of a porosity member of sintering metallicity which has a free passage hole, the accumulator 34 prepared in the lower part of a head 33, and an accumulator 34. And each minor diameter discharge tube 24 of the 2nd burner 14 opened the predetermined clearance mutually, penetrated the accumulator 34 and the head 33 from the lower part of an accumulator 34, and has projected them in the fission reactor 11. Moreover, the aspirator-type mixer which attracts oxygen content gas and is mixed by the flow of fuel gas as a gas blender 35 can be used.

[0052] If oxygen content gas and fuel gas are independently supplied to each gas blender 35 by considering as such a configuration by the oxygen content gas supply piping 36 and the fuel gas charging line 37, respectively, oxygen content gas and fuel gas will flow in an accumulator 34 as mixed gas from the exhaust nozzle of a gas blender 35, being mixed. And the mixed gas which flowed in the accumulator 34 can be moved to the field exposed to the 1st reaction band 13 side from the field by the side of an accumulator 34 through the free passage hole in a head 33, and can be spouted in the 1st reaction band 13. Therefore, a combustion gas style hot in the 1st reaction band 13 can be formed by burning the mixed gas which blew off in the 1st reaction band 13. And the coal-for-coke-making-ized hydrogen supplied through the coal-for-coke-making-ized hydrogen charging line 25 into the flowing hot combustion gas style from the 1st reaction band 13 can be supplied from the delivery 15 of each minor diameter discharge tube 24, and coal-for-coke-making-ized hydrogen can be pyrolyzed to homogeneity in a short time.

[0053] In addition, since it is substantially the same, detailed explanation is abbreviated to the

manufacture approach of the fullerene which used the manufacturing installation 26 of the fullerene which the manufacture approach of the fullerene which used the manufacturing facility 31 of the fullerene concerning the gestalt of operation of the 4th of this invention requires for the gestalt of the 3rd operation.

[0054] It is the description that the 1st burner 41 which has the header tubing 40 with which the jet nozzle 39 of the minor diameter of a large number which the mixed gas to which the manufacturing installation 38 of the fullerene which start the gestalt of operation of the 5th of this invention as show in drawing 5 was attached in base 17a by the side of the other end of the side attachment wall section 17 , and premixing of oxygen content gas and the fuel gas was carried out spouts sets a clearance , and is form is supply . Therefore, only the 1st burner 41 with which structures differ is explained, the same sign is given to the same component as the manufacturing facility 10 of the fullerene concerning the gestalt of the 2nd operation, and detailed explanation is omitted.

[0055] The header tubing 40 had two or more circular canal 40a which prepared the clearance on this alignment, respectively and has been arranged to the axial center of a fission reactor 11, and has connected each circular canal 40a to mixed-gas charging line 30a. And through the clearance between each circular canal 40a, each minor diameter discharge tube 24 of the 2nd burner 14 penetrates the 1st reaction band 13, and is arranged. Therefore, if the mixed gas which carried out premixing of oxygen content gas and the fuel gas is supplied to each circular canal 40a through mixed-gas charging line 30a, mixed gas will be spouted in the 1st reaction band 13 from each jet nozzle 39 of each circular canal 40a. For this reason, a combustion gas style hot in the 1st reaction band 13 can be formed by burning the mixed gas which blew off in the 1st reaction band 13. And the coal-for-coke-making-ized hydrogen supplied through the coal-for-coke-making-ized hydrogen charging line 25 into the flowing hot combustion gas style from the 1st reaction band 13 can be supplied from the delivery 15 of each minor diameter discharge tube 24, and coal-for-coke-making-ized hydrogen can be pyrolyzed to homogeneity in a short time. In addition, since it is substantially the same, detailed explanation is abbreviated to the manufacture approach of the fullerene which used the manufacturing installation 10 of the fullerene which the manufacture approach of the fullerene which used the manufacturing installation 38 of the fullerene concerning the gestalt of operation of the 5th of this invention requires for the gestalt of the 2nd operation.

[0056] As compared with the manufacturing installation 10 of the fullerene which the manufacturing installation 42 of the fullerene concerning the gestalt of operation of the 6th of this invention requires for the gestalt of operation of the 2nd of this invention, it is the description that the structures of the 1st burner 43 differ. Therefore, only the 1st burner 43 with which structures differ is explained, the same sign is given to the same component as the manufacturing installation 10 of the fullerene concerning the gestalt of the 2nd operation, and detailed explanation is omitted. Namely, as shown in drawing 6 , the 1st burner 43 attached in base 17a by the side of the other end of the side-attachment-wall section 17 is produced with a heat-resistant metal. It has the 2nd header tubing 47 with which the jet nozzle 46 of the minor diameter of a large number which the 1st header tubing 45 with which the jet nozzle 44 of the minor diameter of a large number which spout oxygen content gas set the clearance, and was formed, and the 1st header tubing 45 have a clearance, are arranged, and spout fuel gas set the clearance, and was formed. Furthermore, the oxygen content gas supply piping 20 and the fuel gas charging line 22 which supply independently oxygen content gas and said fuel gas, respectively are connected to the 1st header tubing 45 and the 2nd header tubing 47. Moreover, each minor diameter discharge tube 24 of the 2nd burner 14 penetrated base 17a through the clearance between the 1st header tubing 45 and the 2nd header tubing 47, and has projected it in the fission reactor 11.

[0057] Oxygen content gas can be supplied to the 1st header 45 through the oxygen content gas supply piping 20, and it can be made to blow off from the jet nozzle 44 in a fission reactor 11 by considering as such a configuration. Moreover, fuel gas can be supplied to the 2nd header 47 through the fuel gas charging line 22, and it can be made to blow off from the jet nozzle 46 in

a fission reactor 11. After the oxygen content gas and fuel gas which blew off from each jet nozzles 44 and 46 are emitted, diffusive mixing of them will be carried out, they will be in the uniform mixed state, and burn in the 1st reaction band 13. And the formed hot combustion gas flows into the 2nd reaction band 16 of the downstream. And the coal-for-coke-making-ized hydrogen supplied through the coal-for-coke-making-ized hydrogen charging line 25 into the flowing hot combustion gas style from the 1st reaction band 13 can be supplied from the delivery 15 of each minor diameter discharge tube 24, and coal-for-coke-making-ized hydrogen can be pyrolyzed to homogeneity in a short time. In addition, since it is substantially the same, detailed explanation is abbreviated to the manufacture approach of the fullerene which used the manufacturing installation 10 of the fullerene which the manufacture approach of the fullerene which used the manufacturing installation 42 of the fullerene concerning the gestalt of operation of the 6th of this invention requires for the gestalt of the 2nd operation.

[0058] As mentioned above, although the gestalt of operation of this invention was explained, modification in the range which this invention is not limited to the gestalt of this operation, and does not change the summary of invention is possible, and also when it constitutes the manufacture approach of the fullerene of this invention, and its equipment combining the gestalt of each operation, or above mentioned a part or above mentioned all of a modification, it is the right range of this invention. For example, although constituted from two or more circular canal 40a arranged on this alignment to the axial center of a fission reactor 11 in the header tubing 40 with the gestalt of the 5th operation, a clearance may be prepared and two or more straight pipes may be arranged in in the shape of a grid, respectively. Moreover, although the clearance was prepared on this alignment to the axial center of a fission reactor 11 and two or more 1st header tubing 45 and 2nd header tubing 47 have been arranged with the gestalt of the 6th operation, a clearance may be prepared and the 1st header tubing and the 2nd header tubing may be arranged in in the shape of a grid, respectively. Furthermore, although the minor diameter discharge tube 24 of the 2nd burner 14 was produced with heat-resisting steel, such as stainless steel, and the porosity member was produced with the heat-resistant sintered metal with the gestalt of the 3rd and the 4th operation, it is also producible with a cermet and the ceramics.

[0059]

[Effect of the Invention] In the manufacture approach of fullerene according to claim 1 to 3 The 1st reaction band which oxygen content gas and a fuel are supplied [band], burns them and makes a hot combustion gas style form in a fission reactor, The manufacturing installation of the fullerene characterized by having the coal-for-coke-making-ized hydrogen feed hopper which supplies the coal-for-coke-making-ized hydrogen gasified in the middle of this combustion gas style, and having the 2nd reaction band which makes coal-for-coke-making-ized hydrogen react and makes fullerene generate is used. Since the pressure of the 2nd reaction band is made under into atmospheric pressure, the pyrolysis of coal-for-coke-making-ized hydrogen can advance to homogeneity, the generation effectiveness of fullerene can be raised, and fullerene can be manufactured cheaply and easily in large quantities.

[0060] On the other hand, in the manufacture approach of the fullerene by the above and the well-known combustion method, usual is the same and the fuel for a combustion reaction and the raw material for fullerene generation cannot select a fuel required for a hydrocarbon fuel combustion reaction to arbitration. On the other hand, since the fuel for a combustion reaction and the raw material for manufacture of fullerene can be selected separately according to this invention, when manufacturing fullerene especially on a scale of industry, the cheap original fuel of cost can be freely chosen according to the supply situation of a original fuel.

[0061] It sets to the manufacture approach of fullerene according to claim 2 especially. By being able to keep the conditions of the 2nd reaction band constant over all the cross sections in a furnace, and adjusting the conditions in this band on conditions from which the yield of fullerene serves as max, since the 2nd reaction band is in the downstream of the 1st reaction band Since the field which fullerene generates can be extended to max, compared with the usual combustion method, the yield of fullerene becomes high. On the other hand, although

fullerene mainly generates in a flame in the conventional combustion method, generally, a flame has temperature distribution and it is known that fullerene will generate in the specific field of a flame.

[0062] In the manufacture approach of fullerene according to claim 3, since the temperature of the 2nd reaction band is 1000 degrees C or more, the pyrolysis of the supplied coal-for-coke-making-ized hydrogen can be carried out in a short time certainly, and fullerene can be manufactured in large quantities.

[0063] In the manufacturing installation of fullerene according to claim 4 to 13 The 1st reaction band which oxygen content gas and fuel gas are supplied [band] through the 1st burner, burns these, and makes a hot combustion gas style form in a fission reactor, Since it has the 2nd reaction band which it is [band] in the downstream of the 1st reaction band, makes the coal-for-coke-making-ized hydrogen which has the delivery of the 2nd burner which supplies coal-for-coke-making-ized hydrogen in the style of combustion gas, and was gasified and supplied react in a combustion gas style, and makes fullerene generate Both control of the combustion condition of a fuel and control of the pyrolysis of coal-for-coke-making-ized hydrogen become easy, and it becomes possible to manufacture fullerene in large quantities, cheaply, and easily.

[0064] Especially, in the manufacturing installation of fullerene according to claim 5, since the delivery of the 2nd burner has a clearance in the upstream of the 2nd reaction band, and a large number formation is carried out and it carries out distributed emission of the coal-for-coke-making-ized hydrogen into a combustion gas style, it can pyrolyze coal-for-coke-making-ized hydrogen to homogeneity in combustion gas in a short time, and becomes possible [making high yield of the fullerene made to generate from the pyrolysis object of coal-for-coke-making-ized hydrogen].

[0065] In the manufacturing installation of fullerene according to claim 6 Since the 2nd burner consists of a minor diameter discharge tube of a large number arranged by penetrating the 1st reaction band Distributed emission can be carried out uniformly, the coal-for-coke-making-ized hydrogen by which the preheating was carried out into the combustion gas style of the elevated temperature of the 2nd reaction band can be pyrolyzed, and it becomes possible to make high yield of the fullerene made to generate from the pyrolysis object of coal-for-coke-making-ized hydrogen.

[0066] In the manufacturing installation of fullerene according to claim 7, since the 1st burner emits oxygen content gas and fuel gas independently and it has two or more oxygen content gas nozzles and fuel gas nozzles by which mixture arrangement was carried out, you can carry out diffusive mixing of the oxygen content gas and fuel gas which were supplied, they can make it exist in the 1st reaction band by the uniform mixed state, and become possible [carrying out the perfect combustion of the fuel gas easily in the 1st reaction band]. Consequently, a hot combustion gas style can be formed and it becomes possible to make high yield of the fullerene made to generate from the pyrolysis object of coal-for-coke-making-ized hydrogen.

[0067] In the manufacturing installation of fullerene according to claim 8, since it blows off where the head of the 1st burner consisted of a porosity member and oxygen content gas and fuel gas are mixed from a front face, oxygen content gas and fuel gas can be supplied to the 1st reaction band, where premixing is carried out, and it becomes possible to carry out the perfect combustion of the fuel gas easily in the 1st reaction band. Consequently, a hot combustion gas style can be formed and it becomes possible to make high yield of the fullerene made to generate from the pyrolysis object of coal-for-coke-making-ized hydrogen.

[0068] In the manufacturing installation of fullerene according to claim 9, since mixing of oxygen content gas and fuel gas is performed within the 1st burner and oxygen content gas and fuel gas are independently supplied to the 1st burner for another piping, it is not necessary to establish the premixing means of oxygen content gas and fuel gas, and the configuration of the manufacturing installation of fullerene can be simplified.

[0069] In the manufacturing installation of fullerene according to claim 10, since the accumulator which premixing of oxygen content gas and the fuel gas was carried out, and was prepared in the lower part of a head is supplied, structure of the 1st burner can be simplified

and the cost of the 1st burner can be reduced.

[0070] In the manufacturing installation of fullerene according to claim 11 the 1st burner Since the oxygen content gas and fuel gas by which have header tubing with which the jet nozzle of many minor diameters set the clearance, and was formed, and premixing was carried out to header tubing are supplied Where premixing is carried out, distributed emission of oxygen content gas and the fuel gas can be carried out in the 1st reaction band, and it becomes possible to carry out the perfect combustion of the fuel gas easily in the 1st reaction band. Consequently, a hot combustion gas style can be formed and it becomes possible to make high yield of the fullerene made to generate from the pyrolysis object of coal-for-coke-making-ized hydrogen.

[0071] In the manufacturing installation of fullerene according to claim 12 The 1st header tubing with which the jet nozzle of the minor diameter of a large number which spout oxygen content gas set the clearance, and the 1st burner was formed, It has the 2nd header tubing with which the jet nozzle of the minor diameter of a large number which have a clearance with the 1st header tubing, are arranged, and spout fuel gas set the clearance, and was formed. Since oxygen content gas and fuel gas are independently supplied to the 1st header tubing and the 2nd header tubing for another piping, respectively Diffusive mixing of the oxygen content gas and fuel gas by which distributed emission was carried out can be carried out, they can be in the uniform mixed state, can make it exist in the 1st reaction band, and become possible [carrying out the perfect combustion of the fuel gas easily in the 1st reaction band]. Consequently, a hot combustion gas style can be formed and it becomes possible to make high yield of the fullerene made to generate from the pyrolysis object of coal-for-coke-making-ized hydrogen.

[0072] It can prevent that fill up the heat energy consumed when coal-for-coke-making-ized hydrogen pyrolyzed, and the temperature of combustion gas falls since oxygen content gas is mixed in the manufacturing installation of fullerene according to claim 13 in the coal-for-coke-making-ized hydrogen supplied from the 2nd burner, and it becomes possible to make high yield of the fullerene made to generate from the pyrolysis object of coal-for-coke-making-ized hydrogen.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] (A) and (B) are the explanatory view of the fullerene manufacturing installation which applied the manufacture approach of the fullerene concerning the gestalt of operation of the 1st of this invention, and a plane section Fig., respectively.
[Drawing 2] (A) and (B) are the explanatory view of the manufacturing installation of the fullerene concerning the gestalt of operation of the 2nd of this invention, and a plane section Fig., respectively.
[Drawing 3] (A) and (B) are the explanatory view of the manufacturing installation of the fullerene concerning the gestalt of operation of the 3rd of this invention, and a plane section Fig., respectively.
[Drawing 4] It is the partial explanatory view of the manufacturing installation of the fullerene concerning the gestalt of operation of the 4th of this invention.
[Drawing 5] (A) and (B) are the explanatory view of the manufacturing installation of the fullerene concerning the gestalt of operation of the 5th of this invention, and a plane section Fig., respectively.
[Drawing 6] (A) and (B) are the explanatory view of the manufacturing installation of the fullerene concerning the gestalt of operation of the 6th of this invention, and a plane section Fig., respectively.
[Description of Notations]
The 1st reaction band, the 2:2nd reaction band, 3 : 1: The manufacturing installation of fullerene, 3a : A fission reactor, 4:coal-for-coke-making-ized hydrogen feed hopper, 5, 6:oxygen content gas supply opening, 7: The manufacturing installation of a fuel feed hopper and 10:fullerene, 11:fission reactor, 12 : The 1st burner, 13: The 1st reaction band, 14 : The 2nd burner, 15:delivery, the 16:2nd reaction band, 17: The side-attachment-wall section, a 17a:base, 18:exhaust port, 19:edge wall, 20 : Oxygen content gas supply piping, 21: An oxygen content gas nozzle, 22:fuel gas charging line, 23 : A fuel gas nozzle, 24: A minor diameter discharge tube, 25:coal-for-coke-making-ized hydrogen charging line, 26 : The manufacturing installation of fullerene, 27 : A 1st burner, 28:head, 29:accumulator, 30, and 30a:mixed-gas charging line, 31: The manufacturing installation of fullerene, 32 : The 1st burner, 33:head, 34 : An accumulator, 35:gas blender, 36:oxygen content gas supply piping, 37:fuel gas charging line, the manufacturing installation of 38:fullerene, 39:jet nozzle, 40:header tubing, a 40a:circular canal, and 41: -- the manufacturing installation of the 1st burner and 42:fullerene, and 43: -- the 1st burner, 44:jet nozzle, and 45: -- the 1st header tubing, 46:jet nozzle, and 47: -- the 2nd header tubing

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[Translation done.]

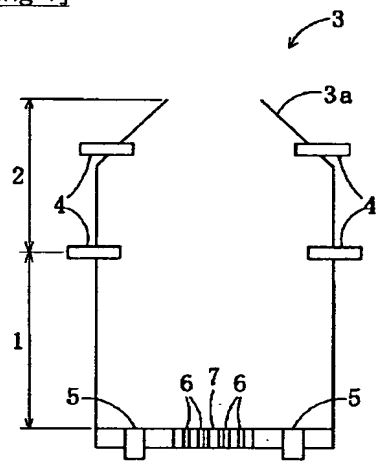
* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

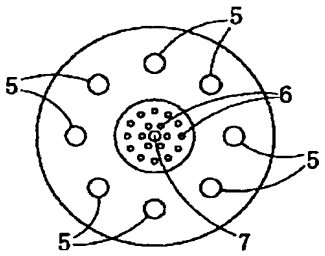
DRAWINGS

[Drawing 1]

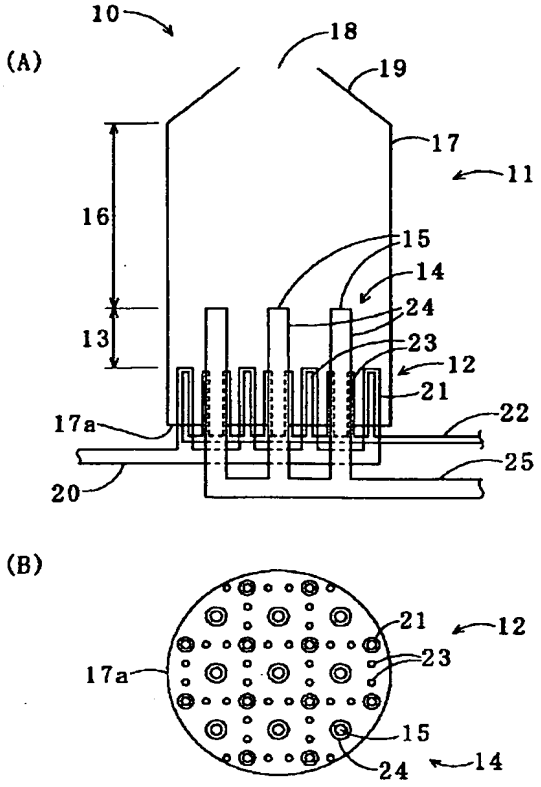
(A)



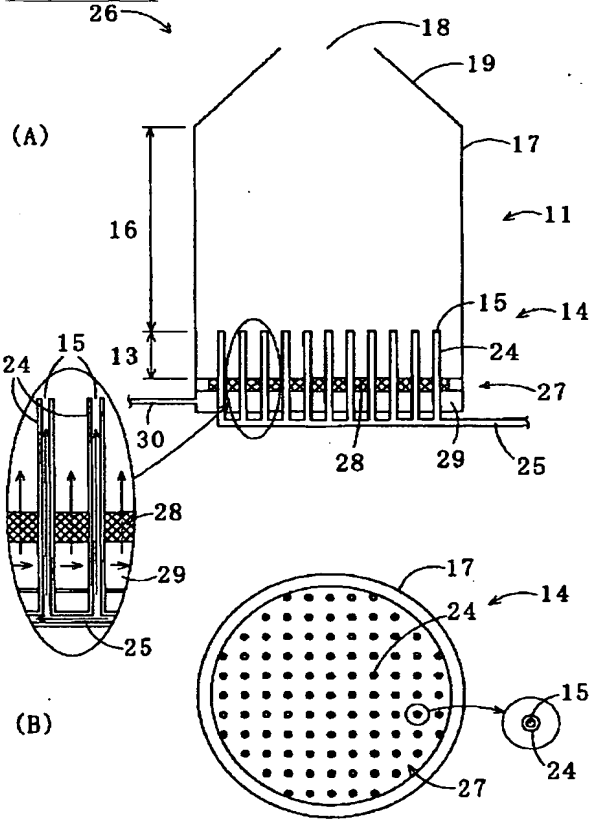
(B)



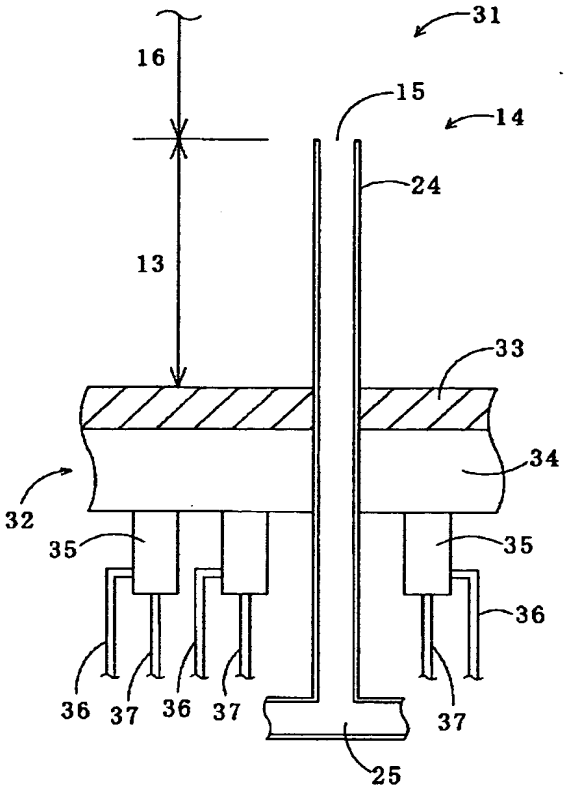
[Drawing 2]



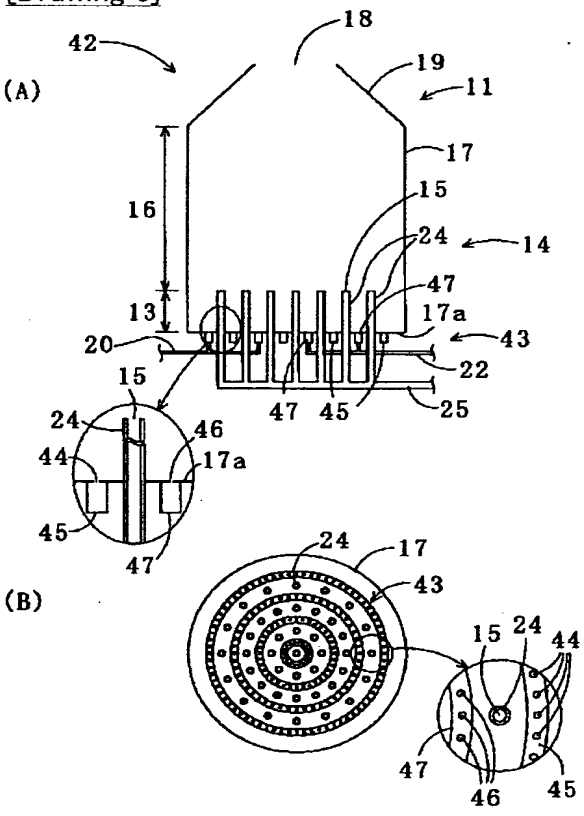
[Drawing 3]



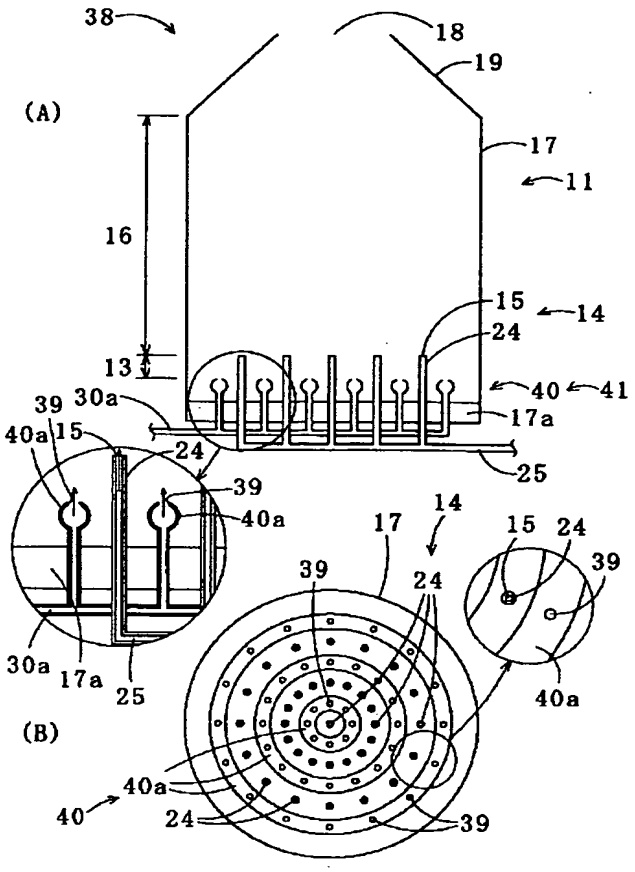
[Drawing 4]



[Drawing 6]



[Drawing 5]



[Translation done.]